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Acceptability and feasibility of a self-management intervention for women prescribed tamoxifen

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Abstract

Objective: Up to 50% of breast cancer survivors prescribed tamoxifen do not take it as prescribed for the full duration, which is linked to increased risk of recurrence and mortality. This paper tests the feasibility and acceptability of a self-directed psycho-educational intervention to support medication taking.
Design: A single arm pre-post design was used with 33 women with sub-optimal adherence to tamoxifen (scores≤24 on the Medication Adherence Rating Scale, range 5-25) taking part in the intervention over two to twelve weeks.
Method: Feasibility was assessed via eligibility, uptake and retention. Questionnaires were completed pre- and post- intervention, and qualitative interviews were conducted to assess acceptability of the materials.
Results: Recruitment and uptake were good, with 87% of eligible participants agreeing to participate. Two thirds of participants recruited to the study completed the follow-up questionnaires (66%). The qualitative interviews showed that the participants found the materials acceptable and helpful. Paired samples t-tests showed small improvements in adherence over time, as well as improvements in psychosocial targets of the intervention, namely; necessity and concern beliefs, personal control, coherence, distress, symptom experience and self-efficacy for managing side-effects.
Conclusions: The intervention appears to be acceptable and feasible in this population and has the potential to improve both adherence and quality of life in breast cancer survivors prescribed tamoxifen. Larger scale trials are needed however to establish the efficacy of the materials.

Keywords: Breast neoplasms, Cancer, Feasibility Studies, Tamoxifen, Patient Education, Patient Adherence

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Background

Over one million women worldwide are diagnosed with breast cancer annually (Parkin, Bray, Ferlay & Pisani, 2005). As mortality decreases (Narod, Iqbal, & Miller, 2015), increasing numbers of survivors of oestrogen receptor positive breast cancer are being prescribed adjuvant hormone therapy (HT) such as tamoxifen. Taken for up to ten years, tamoxifen can significantly reduce the risk of breast cancer recurrence and mortality (EBCTCG, 1998). However, many women prematurely discontinue tamoxifen before the prescribed duration, known as non-persistence, or do not take doses as prescribed, known as non-adherence (Hershman et al., 2011; Partridge, Wang, Winer & Avorn, 2003). Both non-persistence and non-adherence are associated with increased risk of recurrence and mortality (Barron, Cahir, Sharp & Bennett, 2013; Hershman et al., 2011).

Despite the high rates and clinical implications of non-adherence, few interventions have been developed to improve adherence to tamoxifen. A series of education-based interventions have been conducted with other HTs, but none have shown significant differences in adherence between the intervention and control groups (Hadji et al., 2013; Neven et al., 2014; Yu et al., 2012; Ziller et al., 2013). However, higher satisfaction with information received and improvements in knowledge have been shown (Bourmaud et al., 2016; Heisig et al., 2015).

The current intervention was developed to address the need for more effective interventions supporting tamoxifen adherence. It took the form of a self-directed paper-based booklet developed in line with the precepts of cognitive behavioural therapy (CBT) and behaviour change theory to modify key beliefs about breast cancer recurrence and tamoxifen, manage side-effects and increase perceived behavioural control (PBC) over medication taking.

Content development was rigorous (Moon, 2017) and followed and Intervention Mapping approach based on empirical evidence and two theories of health behaviour; the Common-Sense Model of illness (Leventhal & Ian, 2012) and the Theory of Planned Behaviour (Ajzen, 1991) which increases the likelihood of successful intervention (Haynes, McDonald, Garg & Montague, 2002). The intervention also aimed to overcome some of the limitations of previous interventions by focusing specifically on women demonstrating sub-optimal adherence (Ekinci et al., 2018) and addressing the distinct concepts and unique determinants of both intentional and unintentional non-adherence (Moon, Moss-Morris, Hunter & Hughes, 2017b; Wouters et al., 2014).

Intentional non-adherence here refers to the deliberate decision not to take medication, whereas unintentional non-adherence refers to forgetting, or lacking the capacity or resources to take medication correctly (Clifford et al., 2008). By directly targeting known determinants of tamoxifen non-adherence through a self-management programme, this intervention has the potential to be widely implemented and to improve clinical and psychosocial outcomes.

The current study aimed to assess the feasibility and acceptability of the intervention materials, prior to testing in a larger randomised controlled trial, in line with UK Medical Research Council guidance on developing complex interventions (Craig et al., 2008).

The primary objectives of the study were to assess i) the feasibility and ii) acceptability of the intervention. Secondary objectives were to calculate the effect size of any changes in adherence or any psychosocial variables associated with adherence that were targeted in the intervention.

Methods

Design

An exploratory single arm pre-post design was used with all participants allocated to the intervention condition. The intervention was expected to last 4-6 weeks. Full National Health Service (NHS) Research Ethics Committee (REC) and Health Research Authority (HRA) approval was granted (REC Ref: 16/LO/1205).

Participants

Eligible patients were female, ≥18 years old, had a diagnosis of primary breast cancer, had been prescribed adjuvant tamoxifen and had suboptimal levels of adherence, as evidenced by scoring <25 on the Medication Adherence Rating Scale (MARS; Horne, Hankins, & Jenkins, 2001). Participants had to be able to consent for themselves and read and speak English. Exclusion criteria were a diagnosis of secondary breast cancer, being on a prescribed course of tamoxifen due to end within the next 4-6 weeks, or receiving a diagnosis of depression in the past year.

Recruitment

Recruitment took place over six-months using convenience sampling. Twenty-six eligible women were approached through breast clinics at four NHS trusts across England, where they were identified by clinic staff, provided with study information and completed a screening questionnaire. Invitations were sent to 99 participants from a database of women who had consented to being contacted about future research. These participants were screened based on information they provided as part of a previous study. Finally, adverts were placed on Facebook groups and 7 interested patients contacted the research team to be screened for eligibility. A total of 132 women were approached. All participants provided informed consent.

Procedure

Participants completed a baseline questionnaire with reminders sent after one week if not completed. After completing the baseline questionnaire, women were sent the intervention booklets and asked to notify the researcher when they had completed the intervention materials. They then completed the follow-up questionnaire and were invited to be interviewed about their experiences of the intervention. Semi-structured interviews were

conducted via telephone for approximately twenty minutes. Interviews were conducted by an independent researcher who was not involved in the intervention development or delivery.

Outcome measurements

Primary outcomes

Feasibility of delivering the intervention was assessed by:

- The percentage of eligible women within the recruitment centres.
- The percentage of eligible women agreeing to participate (uptake).
- The percentage of women remaining until the close of the study (retention).

Acceptability was assessed using semi-structured interviews with women who took part in the intervention.

Secondary outcomes

Adherence was measured using the Medication Adherence Rating Scale (MARS; Horne et al., 2001) which includes five statements scored on a five-point scale from always to never. Four items measure intentional non-adherence (e.g. *I alter the dose of my tamoxifen tablets)*, with a total score of 20, and one item measures unintentional non-adherence (*I forget to take my tamoxifen)*, with a total score of 5. Lower scores indicate more non-adherence.

The scale attempts to mitigate social desirability bias by framing questions in a non-threatening and non-judgemental way. The scale has demonstrated good internal and test-retest reliability (Horne et al., 2001) and has been used successfully in breast cancer survivors (Cronbach's alpha=0.68, Grunfeld, Hunter, Sikka & Mittal, 2005). Following previous research, women were classified as non-adherent if they scored <25 (Timmers et al., 2016; van der Laan et al., 2017). This cut-off helps to counter-balance the over-estimation of adherence rates (Hüther et al., 2013). Participants also self-reported if they had discontinued tamoxifen treatment, and if so, why.

Illness and treatment beliefs were measured using the Beliefs about Medicines Questionnaire (BMQ) and the Illness Perceptions Questionnaire for Breast Cancer Survivors (IPQ-BCS). The BMQ measures beliefs about the necessity of taking tamoxifen and concerns about it (Horne, Weinman, & Hankins, 1999). A differential score was calculated by subtracting necessity beliefs from concerns, with higher differential scores indicating a more positive cost/benefit analysis. The IPQ-BCS measures the following illness perceptions; tamoxifen consequences, breast cancer consequences, cure, risk of recurrence, treatment control, personal control, coherence, emotional representations and causal beliefs (Moon, Moss-Morris, Hunter & Hughes, 2017a). Each subscale was assessed using four items scored on a five-point Likert scale.

Distress was measured using the one factor global distress score of the Hospital Anxiety and Depression Scale (HADS; Norton, Cosco, Doyle, Done & Sacker, 2013). Quality of life (QOL)

and side-effects were measured using the FACT-ES, a tailored QOL scale for women on HT (Fallowfield, Leaity, Howell, Benson & Cella, 1999). An additional concerns subscale lists potential side-effects of HT. Additionally, women were asked to rate their confidence in managing key symptoms on a 10-point scale ranging from 10 (not confident) to 100 (very confident), using a modified version of a standard self-efficacy scale which has been used previously in this population (Shelby et al., 2014). The Satisfaction with Information about Medicines Scale (SIMS) was used to determine how informed people feel about different aspects of their treatment (Horne et al., 2001).

Intervention

Participants completed a four-part self-directed psychoeducational manual. The intervention is described in detail elsewhere (Moon, 2017) and its content is summarised in Table 1. The intervention consisted of four one-week sections: (1) what is tamoxifen, (2) how to take tamoxifen, (3) side-effects of tamoxifen, and (4) support. Participants complete a series of CBT-based activities and behaviour change techniques in an accompanying activity booklet. Participants were directed to complete SMART (Specific, Measurable, Attainable, Relevant and Time-bound) goals in relation to their medication taking and symptom management. Intervention materials were accompanied by an explanatory telephone call from the researcher. An additional telephone call around two weeks later discussed progress and provided assistance with activities. Telephone calls lasted between 10-20 minutes.

Table 1 about here

Statistical analysis

Based on recommendations for feasibility studies and an expected attrition rate of 20%, the desired sample size was 40 participants (Julious, 2005). Statistical analysis was carried out using SPSS v21 (SPSS Inc., Chicago, IL). Percentages of women who; i) were eligible to participate; ii) consented to participate and; iii) completed follow-up measures were calculated. Independent samples *t*-tests or chi-squared tests were used to compare women who completed the study with women who withdrew or were lost to follow-up. Paired samples *t*-tests were used to examine changes over time to study variables. The Wilcoxon Signed Rank Test was used to examine changes over time in non-normally distributed data. Cohen's *d* was calculated to assess the effect sizes based on the mean differences between pre- and post-intervention, with the following rules of thumb used to denote small (d=0.2), medium (d=0.5) and large (d=0.8) effect sizes. Statistical significance was defined as a two-tailed $p<0.05$. Baseline data were carried forward for participants who did not complete follow-up questionnaires, and missing item level data were replaced using mean substitution. The qualitative interviews were transcribed verbatim and analysed using thematic analysis.

Results

Sample Characteristics

Participant demographics are shown in Table 2. The mean age was 51 years (*SD*=6.1, range 41-68). The majority of women were White British (79%), married or in a Civil Partnership (52%) and were employed (89%). Participants were mostly pre or peri-menopausal at diagnosis (76%) and had stage I (39%) or stage II (43%) breast cancer. Characteristics were similar for those who only completed the baseline questionnaires and those who completed the follow-up questionnaires.

Table 2 about here

Feasibility: Recruitment and uptake

Figure 1 shows the recruitment and uptake rates across the different recruitment methods. Twenty-six eligible women were approached in clinic, of whom twenty consented (77%). Invitations were sent to 99 participants from the database, of whom 53 responded (54% response rate). Eighteen women were eligible and all consented to participate. Seven women responded to the Facebook adverts and three were eligible, all of whom took part in the study. The uptake rate across the three recruitment methods was 87%.

[Figure 1 about here]

Feasibility: Retention rates

Retention through the study is also shown in Figure 1. Forty-one women consented, of whom eight (20%) did not complete baseline questionnaires or continue with the study. Of the 33 women who did complete the baseline questionnaire, 28 completed the intervention materials (68% of recruited sample, 85% of those beginning study procedures). Five women did not complete the intervention materials, four of whom were lost to follow-up after completing the initial telephone call and one who was too busy to participate. Follow-up questionnaires were completed by 27 women (66% of total recruited sample, 82% of those beginning study procedures). Participants took on average seven weeks (*SD*=2.6) to complete the intervention (range 2-12 weeks).

Independent sample *t*-tests indicated that women who did not complete the study had lower MARS unintentional adherence scores at baseline (*M*=3.00, *SD*=0.00) than women who did complete the study (*M*=3.67, *SD*=0.6, *t*[26]=5.59, *p*<.001), indicating more unintentional non-adherence. No other significant differences were seen across groups (see supplementary material).

Feasibility: Qualitative interviews

The interviews showed that the materials and study procedures were feasible. Some participants reported being busy and only engaged with sections which seemed relevant to them whereas the majority found it easy to fit into their lives. Most participants found the telephone support helpful, but nearly all said they found it easy to work through the manual alone. Some participants felt that the intervention would be better suited as a website or

app, so they could add things on the go. However, a few women preferred the paper-based materials to avoid screen time.

Acceptability: Qualitative interviews

Three themes were identified in the data: satisfaction with materials, areas for improvement and the ideal time-point for receiving the intervention. Additional quotations in supporti of the themes are included in the online supplementary material.

Satisfaction with materials.

The materials were acceptable, well liked and were viewed as forming a useful resource for the future.

> "I think it's amazing and I'm just sad that I didn't have it when I started because I would have found it really, really useful." *Karen, 54*

Information about tamoxifen was well received, particularly the diagrams which helped women to understand why they were prescribed tamoxifen, how it works and why it is important to take it every day.

> "That started it off on a real positive for me because I thought; oh I understand now what tamoxifen is and what it is for…I thought it was really beneficial.." *Kerry, 48*

The implementation intentions exercise to pair taking tamoxifen with daily routine was very well received by women who did not already have this strategy in place, with women describing behaviour changes which had resulted in them remembering to take tamoxifen more reliably.

> "So, when I'm eating my dinner, then I should just have had my tamoxifen, kind of thing. So that, it definitely helps, definitely missed it less often." *Sharon, 50*

Some women also discussed skipping fewer doses now that they understood what happened to their bodies when they were not taking it.

> "So, there have been occasions when I've gone perhaps a week without taking it. I don't think I would do that now. So that's been good…I just sort of thought, oh it will be all right and I hadn't quite realised fully how it works." *Linda, 67*

Participants also found the section on side-effects very helpful. The information on why certain side-effects occur and the overview of CBT was well received. Women discussed changes to the way they viewed their symptoms.

> "I had to stop worrying that I was maybe flustered and actually just breathe through it, not focus on it so much, just let it happen. That really worked." *Nancy, 51*

Most women also discussed their SMART (Specific, Measurable, Attainable, Relevant, Time-

based) goals and the strategies they had implemented as a result of the intervention. The information about possible side-effects also helped women with feeling less alone.

> "So I thought, right I'm getting back to swimming and I've been going and I've been trying to do an extra length each time. So, yes, I have set a goal and I am trying to keep to that." *Linda, 67*

Areas for improvement.

A few women read the materials but did not complete the activities because they described themselves as being "lazy" or because the information was not presented in a learning style they felt suited them.

Not all sections of the intervention were relevant to everyone. Some women experienced no side-effects or already had strategies for managing them or for remembering to take tamoxifen. Section 4 of the intervention booklet on social support was not particularly well received, as most people did not need additional support or had already sought it themselves.

An important issue to consider was the potential for the information to be distressing or upsetting, which led one participant to take a short break from treatment.

> "But when I was reading it, I remember being really struck by it. And I remember feeling really quite sad. I'm sure I've done enough, four and a half years of taking this, I'm stopping. I did, for three days I didn't take it, up until my partner found out…and now I've started taking it again." *Aisha, 46*

Ideal time-point for intervention.

Most women said they would like to receive this intervention at the start of their tamoxifen prescription as a useful resource to drawn on, even if the booklet was not required straight away. However, there was some concern that being shown all of the potential side-effects at the start of treatment might be off-putting or worrying to patients and so the intervention booklet would be better offered later on.

Secondary outcomes: changes to adherence

Table 3 shows changes to outcome variables over time. The percentage of non-adherent women fell from 100% at baseline to 91% at follow-up. The percentage of intentionally non-adherent women did not change. The percentage of unintentionally non-adherent women fell from 97% to 88%, which was reflected by a small improvement (Cohen's d=0.31) in the MARS unintentional scores (p=.058). One woman reported discontinuing treatment during the study period on the recommendation of her specialist breast care nurse.

Table 3 here

Secondary outcomes: changes to illness and treatment related outcomes

Satisfaction with information about tamoxifen and the necessity/concerns differential scores both increased significantly from baseline to follow-up, with a medium effect sizes (Table 3). Medium to large effect statistically significant improvements in personal control and coherence beliefs were seen. HADS distress scores decreased significantly from pre- to post- intervention, but the effect size was small.

Secondary outcomes: changes to side-effect related outcomes

QOL scores improved significantly over time, but the effect size was small. The side-effects subscale of the FACT-ES showed that the symptom experience improved significantly over time, with a medium effect size (Table 4).

Analyses of self-efficacy for managing symptoms were run only in those women who reported experiencing each symptom. Self-efficacy for managing leg cramps/joint pain, vaginal health and fatigue all improved significantly with medium effect sizes. There were small improvements in self-efficacy for managing hot flushes and changes in mood, but these were not statistically significant. When restricting the analysis to only those who reported moderate to severe difficulties with each symptom at baseline, medium to large significant improvements in self-efficacy were seen for all symptoms.

Table 4 around here

Discussion

This paper has described the initial feasibility and acceptability testing of a psychoeducational self-directed intervention for women prescribed tamoxifen. To our knowledge, this is the first intervention of its kind. Results showed that the intervention was feasible and acceptable and had the potential to improve unintentional non-adherence as well as several key variables associated with adherence, such as side-effect management and medication beliefs.

These preliminary results suggest that a larger randomised controlled trial (RCT) would be feasible in this population. Reasonable response rates were seen from study advertisements and uptake from eligible women was high, especially compared with similar self-management interventions (Bourmaud et al., 2016). However, a large proportion of women were ineligible due to high adherence which may present a barrier for future studies. Two thirds of the women recruited were retained to the end of the study, with 82% of those who received the intervention materials completing the study. However, it should be noted that five women (12%) were sent the intervention materials but did not engage with the study.

Women who did not complete the intervention were significantly more non-adherent than women who completed the study, suggesting they could have benefited more from the intervention. The efficacy of the intervention could have been enhanced if these women were included in the full analysis. This is an inherent issue with adherence research and. there is a need to investigate ways to engage and retain non-adherent patients in future studies. However, the uptake and retention rates here are promising

As well as being feasible, the qualitative interviews showed that the intervention materials were acceptable. High satisfaction with the intervention was shown, with women changing their medication taking behaviour, and implementing strategies to manage side-effects as a result. Issues raised included some women not completing the activities, the section on social support not being necessary, and the potential for the information to be distressing. The interviews also highlighted that not all content was relevant to all women. Whilst this is expected, it supports the need for future tailoring of content before embarking on an RCT (Lustria et al., 2013).

The study was powered to assess feasibility and acceptability, not efficacy. Despite this, some significant changes in key outcomes were seen. Satisfaction with information about medication increased significantly with a large effect size. This was highlighted in the qualitative interviews, and may be related to the use of diagrams, which many women reported increased their understanding of tamoxifen, and have been shown elsewhere to reduce dosing errors in those with low health literacy (Yin et al., 2011). An improvement in the necessity/concerns differential was also seen, suggesting more favourable evaluation towards the necessity of tamoxifen following the intervention. This has important implications, as more positive necessity/concerns have been associated with better adherence in a number of studies (Brett et al., 2018; Moon, Moss-Morris, Hunter, Norton & Hughes, 2018).

Side-effect intensity, QOL, distress, and self-efficacy for managing symptoms improved significantly. This is reflected in the qualitative interviews, where women spoke about implementing SMART goals and utilising CBT strategies to manage their side-effects. As difficulty in managing side-effects, rather than presence or frequency, is more closely related to non-adherence, this improved self-efficacy for managing symptoms is particularly important (Shelby et al., 2014).

Whilst there were improvements in variables related to adherence, the improvements to adherence itself were relatively small. All women were non-adherent at trial commencement, and this fell to 91% post-trial. There was a small but non-significant improvement in unintentional non-adherence, dropping from 97% to 88%. The qualitative interviews suggested this was related to using implementation intentions to pair taking tamoxifen with a key daily event. Whilst promising, a large proportion of women remained non-adherent after the trial, and rates of intentional non-adherence did not change. This may be due to several factors. Firstly, it is likely that the sample were too adherent at baseline to detect any improvement. The qualitative interviews showed that the majority of women already had good strategies for taking tamoxifen and forgot very rarely, making very little room for improvement. Future research may benefit from using a stricter cut off to identify sub-optimal non-adherence. Secondly, the measure of non-adherence used may not be sensitive to changes over this relatively short follow-up period (Garfield, Clifford, Eliasson, Barber, & Willson, 2011). One woman reported reductions in intentional non-adherence in the qualitative interviews, which were not reflected in the MARS scores. Changes to key factors including side-effects and medication beliefs may have a delayed effect on improving adherence, as supported by a recent longitudinal analysis (Moon et al., 2018).

Limitations

This was a small study with no control group. Therefore, improvements cannot be conclusively attributed to the intervention. As per the MRC framework for developing complex interventions (Craig et al., 2008), this successful pilot study demonstrates good feasibility and acceptability of the intervention and there is now a need to test the efficacy in a full randomised controlled trial. The small sample size prevents sensitivity analyses to compare the intervention's effectiveness across different levels of non-adherence. The sample was ethnically homogenous, limiting the generalisability of the results. Additionally, women with a diagnosis of depression in the past year were excluded, which may have excluded women at higher risk of non-adherence. Due to the convenience sampling method adopted, there may be some selection bias in the sample. In addition, only 57% of women responded to postal invitations which suggests the sample may not be representative of the wider population. Effect sizes were quantified using rules of thumb for Cohen's *d*. However, these should be interpreted with caution as they do not necessarily indicate whether an effect was clinically relevant, and should be considered in relation to similar interventions. Adherence was measured using a self-report measure which may over-estimate adherence rates and may not provide good concordance with objective measures. Finally, there may be a risk of social desirability bias in the qualitative interviews, although attempts were made to reduce this by making participants aware the interviewer was independent from the intervention.

Clinical Implications

Whilst further testing in an RCT is necessary, the results from this study are promising, showing small improvements to adherence and the potential for further improvements by modifying several key variables such as medication beliefs and side-effects. Important improvements were also seen in distress, side-effect intensity and QOL.

The self-directed nature of the intervention supports broad implementation to large numbers of women. The improvements seen to other psychosocial outcomes suggest that the intervention could be beneficial for all women prescribed tamoxifen, regardless of adherence levels.

Conclusion

To conclude, this intervention appears to be acceptable, feasible and well liked. Improvements were seen in adherence, QOL, medication beliefs, distress and confidence in managing symptoms. The results improve on previous studies which have seen no changes to adherence, perhaps because the intervention addresses several psychosocial constructs as well as providing education (Hurtado-de-Mendoza, Cabling, Lobo, Dash, & Sheppard, 2016). Future research should seek to develop this intervention further, before testing it in a full-scale RCT.

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Conflict of interest statement

All authors declare no conflict of interest.

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Table 1. Intervention content

Section	Content covered
1: What is tamoxifen?	Information on what tamoxifen is, how it works and why women have been prescribed it. Additional components: diagrams, videos.
2*:* How to take tamoxifen	Information on why it is important to take tamoxifen as prescribed, and what happens if you miss doses. Tips for remembering how to take it. Additional components: Implementation intentions activity, addressing concerns about tamoxifen.
3: Side-effects of tamoxifen	Tips for managing side-effects, information on understanding links between thoughts, feelings and behaviours. Additional components: symptom monitoring, SMART goal setting, monitoring progress with goals.
4: Support	Sources of social support, communicating with healthcare professionals.

Table 2. Participant demographics

	Completed baseline questionnaires (*n*=33)	Completed follow-up questionnaires (*n*=27)
Age	*M*=51, *SD*= 6.1 (range 41-68 years)	*M=52, SD=6.3* (range 42-67)
Ethnicity		
White British	26 (79%)	21 (78%)
Other	6 (18%)	5 (19%)
Missing	1 (3%)	1 (4%)
Relationship status		
Single	6 (18%)	5 (19%)
Married/Civil Partnership	17 (52%)	16 (59%)
Separated/Divorced	8 (24%)	6 (22%)
Co-habiting	2 (6%)	0
Job status		
Employed	29 (89%)	24 (89%)
Unemployed	1 (3%)	1 (4%)
Retired	2 (6%)	2 (7%)
Student	1 (3%)	0
Menopausal status at diagnosis		
Pre/peri-menopausal	25 (76%)	19 (70%)
Post-menopausal	6 (18%)	6 (22%)
Unsure	2 (6%)	2 (7%)
Breast cancer stage		
Stage I	13 (39%)	11 (41%)
Stage II	14 (42%)	12 (44%)
Stage III	6 (18%)	4 (15%)
Previous treatment		
Lumpectomy	20 (61%)	17 (63%)
Single Mastectomy	14 (42%)	12 (44%)
Double Mastectomy	1 (3%)	0
Chemotherapy	19 (58%)	14 (52%)
Radiotherapy	23 (70%)	17 (63%)
Years since first prescribed tamoxifen		
<1 year	3 (9%)	1 (4%)
1-2 years	9 (27%)	7 (26%)
2-3 years	10 (30%)	10 (37%)
3-4 years	6 (18%)	6 (22%)
4-5 years	3 (9%)	2 (7%)
>5 years	2 (6%)	1 (4%)

Note. Percentages may not sum 100 because of rounding.

Table 3. Changes to outcome variables over time

	Pre intervention (Mean, *SD*)	Post intervention (Mean, *SD*)	Cohen's *d*	Comparison of pre- and post-scores
MARS total	22.8 (1.6)	23.1 (1.3)	0.15	p=.391†
MARS intentional	19.3 (1.4)	19.4 (1.1)	0.06	p=.786
MARS unintentional	3.5 (0.6)	3.7 (0.7)	0.31	p=.058†
% Non-adherent	100%	91%	-	-
% Intentionally non-adherent	30%	30%	-	-
% Unintentionally non-adherent	97%	88%	-	-
Satisfaction with information about treatment	9.42 (4.5)**	11.73 (4.1)**	0.54	p=.003
Necessity/concerns differential	2.36 (5.2)**	4.76 (5.0) **	0.47	p=.003
Cure beliefs	14.61 (2.2)	14.91 (2.6)	0.13	p=.339
Risk of recurrence beliefs	11.79 (3.6)	10.93 (3.4)	-0.17	p=.082
Tamoxifen consequences	11.97 (4.4)	11.42 (4.0)	-0.13	p=.198
Breast cancer consequences	13.61 (3.2)	13.21 (3.1)	-0.13	p=.196
Personal control	13.85 (2.4) **	14.88 (2.1) **	0.46	p=.002
Treatment control	15.24 (2.2)	15.42 (2.0)	0.06	p=.634
Coherence	13.88 (3.7) ***	16.51 (2.7) ***	0.58	p<.001
Emotional representations	14.36 (4.0)	14.33 (4.3)	-0.01	p=.953
Distress	14.60 (8.6) **	12.58 (7.7) **	-0.25	p=.002

Note. †Indicates that Wilcoxin Signed Ranks Test was used to compare means. * Indicates a significant difference at p<0.05, ** indicates a significant difference at p<0.01. Scores of 25 on the MARS indicate total adherence. Scores of 20 indicate full intentional adherence. Scores of 5 indicate full unintentional adherence.

Table 4. Changes to side-effect related outcomes over time

	Pre intervention (Mean, *SD*)	Post intervention (Mean, *SD*)	Cohen's *d*	Comparison of pre- and post-scores
Quality of life total	122.90 (28.1)**	130.03 (25.4)**	0.26	*p*=.003
FACT-ES Symptom score	48.54 (13.2)***	55.33 (11.44)***	0.54	*p*<.001
Satisfaction with information about treatment	9.42 (4.5)**	11.73 (4.1)**	0.54	*p*=.003
Self-efficacy for managing hot flushes				
In those with hot flushes (*n*=30)	68.33 (25.5)	73.67 (21.9)	0.23	*p*=.084
In those with moderate/severe hot flushes (*n*=18)	56.67 (24.5)*	66.67 (22.8)*	0.42	*p*=.027
Self-efficacy for managing night sweats				
In those with night sweats (*n*=26)	65.38 (26.9)	68.46 (20.9)	0.13	*p*=.448
In those with moderate/severe night sweats (*n*=19)	57.89 (26.2)*	65.79 (22.4)*	0.32	*p*=.043
Self-efficacy for managing leg cramps / joint pain				
In those with leg cramps / joint pain (*n*=28)	58.21 (23.4)*	68.21 (23.4)*	0.42	*p*=.039
In those with moderate/severe leg cramps/joint pain (*n*=17)	50.00 (24.3)**	63.5 (28.5)**	0.51	*p*=.007
Self-efficacy for managing vaginal health related problems				
In those with vaginal health related problems (*n*=31)	61.29 (26.4)**	72.58 (22.3)**	0.46	*p*=.002
In those with moderate/severe vaginal health related problems (*n*=23)	56.52 (24.2)**	67.39 (22.0)**	0.47	*p*=.005
Self-efficacy for managing mood changes				
In those with mood changes (*n*=26)	45.39 (28.7)	51.92 (26.8)	0.24	*p*=.134
In those with moderate/severe symptoms (*n*=18)	35.56 (23.1)**	47.22 (25.9)**	0.48	*p*=.008
Self-efficacy for managing fatigue (*n*=18)	53.33 (25.7)**	67.22 (27.0)**	0.53	*p*=.001
Self-efficacy for managing insomnia (*n*=17)	53.89 (26.2)	57.78 (25.1)	0.15	*p*=.360

Note. * Indicates a significant difference at $p<0.05$, ** indicates a significant difference at $p<0.01$. Higher FACT-ES symptom scores indicate reduced impact of side-effects. Data on severity of insomnia / fatigue is missing.

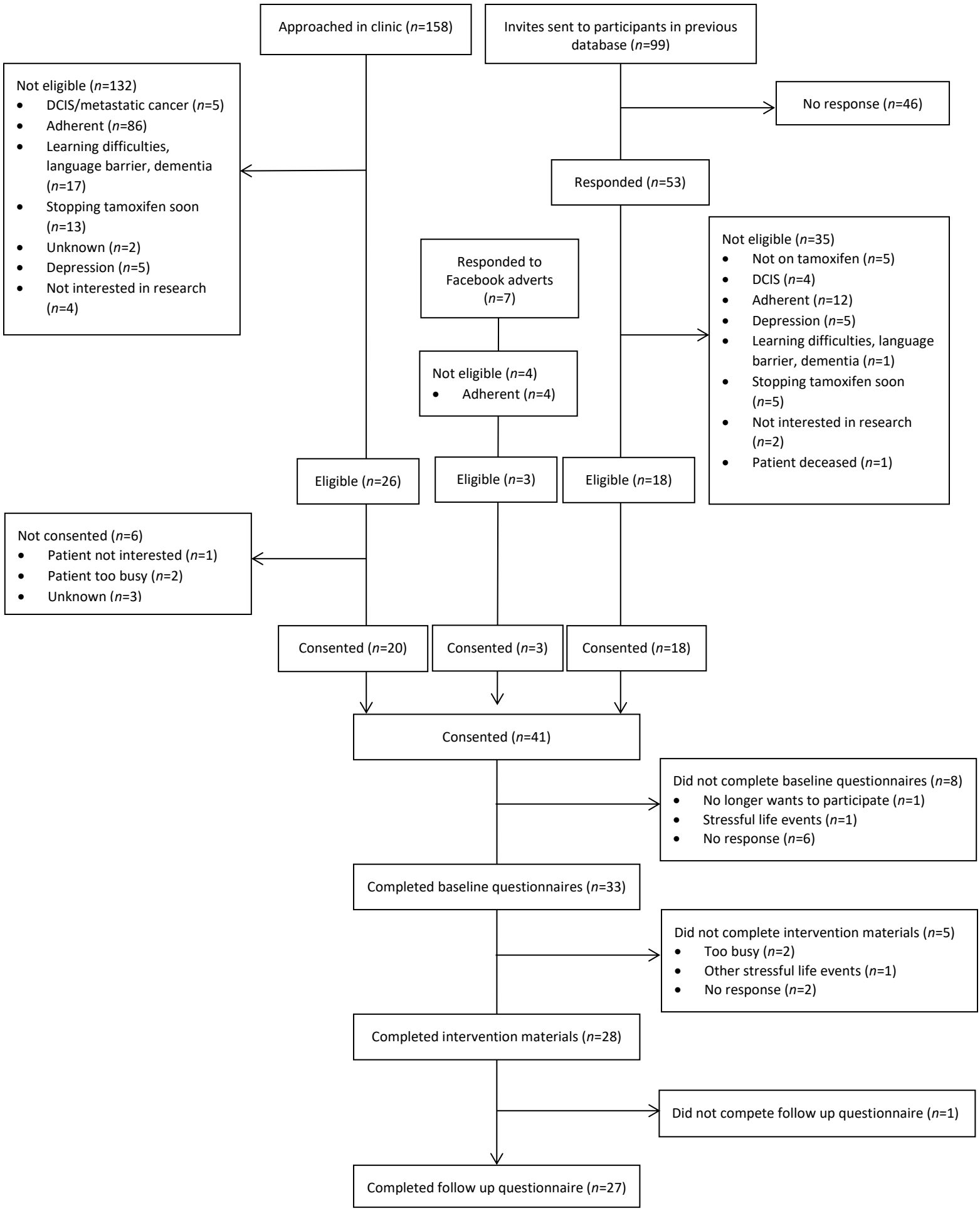

Figure 1. Recruitment, uptake and retention.

DCIS=Ductal Carcinoma in Situ